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grown out. It might also be mentioned that the white edgings of the tail, which in fall and winter are conspicuous and readily apparent in flight, become much restricted or entirely wanting in summer plumage.

Owing to the nature of their feeding grounds not much can be said as to the economic value of Black-tailed Gnatcatchers, but they consume large numbers of moths, which doubtless include some injurious species.

*Los Angeles, California, September 10, 1921.*

## NOTES ON FALL MIGRATIONS OF FOX SPARROWS IN CALIFORNIA

By JOSEPH MAILLIARD\*

WITH the idea of learning more about the fall movements of some of our fox sparrows, and particularly those of the Yolla Bolly Fox Sparrow (*Passerella iliaca brevicauda*), in the autumn of 1919, in company with Mr. Luther Little as assistant, I made a trip to a place on Eel River, near the southwestern base of Mt. Sanhedrin, on the summit of which the latter species is known to breed. The week of September 15 to 20 was passed here, but we found that there was no good fox sparrow country within workable distance of our headquarters. That some were passing through the locality was proved, however, by the sight of two individuals on the morning of September 20, neither of which was secured for identification; but these were evidently of the smaller billed, dark group from the northwest coast, southern Alaska to British Columbia, designated by Swarth as the "Unalaschensis group" (Univ. Calif. Publ. Zool., vol. 21, 1920, p. 89).

My brother, John W. Mailliard, arrived on the afternoon of September 20, and placed his services and car at our disposal for the ensuing week. On account of the lack of good country for observation here it was decided to run up to Lierly's, a well-known hunting resort at a more appreciable elevation and nearer to the summit of Mt. Sanhedrin. During the next day the party identified 37 species of birds, but the only fox sparrow seen was again one of the above group. On September 22, my brother and Little went up to the top of Sanhedrin to ascertain if the Yolla Bolly Fox Sparrows were still there. Several of these were obtained. Having proved this point, we moved next day to Glenbrook, Lake County, just north of Cobb Mountain, at an elevation of 2300 feet. Near this spot is a large tract of brushy territory containing a considerable mixture of ceanothus and manzanita brush, upon the seeds of which the fox sparrows largely subsist.

On the morning of the 24th we went up a few hundred feet higher into this brush country, and immediately commenced to get results. Fox sparrows were not so very numerous but would occasionally appear or could be "squeaked up" from time to time. While none of this genus had been found here during our visit from April 28 to May 3, of the previous spring, the local-

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ity seemed to be a good place in which to intercept migration. The weather was rather warm at this time and, toward noon, as the sun's rays became more intense, the sparrows kept so close to cover that our work had to be postponed until early the next morning.

I had figured on finding some of the Yolla Bolly Fox Sparrows in this place, working down from the higher altitudes of the Sanhedrin range to the north, and was pleased to find the expectation correct. In fact, 60 percent of our take here was of this species, showing that it leaves its breeding ground at about the same time as the earliest northern migrants commence to arrive or, as one might say, drift in.

We passed but two days at Glenbrook and then went back to our former collecting ground at Castle Hot Springs, at an elevation of 2800 feet on the Mt. St. Helena Range, Lake County, just south of Cobb Mountain. Here there is some very good brush country for fox sparrows, at about 3000 feet and upward.

The morning of September 26 was a very warm one. My brother and I went in one direction and Little in another. We went through some forest along an old mining trail into some good-looking brush, securing a few specimens, but soon the heat became so intense that we returned to a woody canyon that ran up through the brush, and camped down near some small pools of water. It was not long before a fox sparrow appeared, and another and another! Soon we discovered that there was a regular stream of them coming to the water holes. We could see only for a few yards on any side and could not well make out whether the birds were approaching from any special direction, but most of them appeared to be coming up the narrow bed of the dry arroyo toward the tiny spring that still contained water, and to a few small holes in the rocky bottom that had a little water left over from an unusual summer rain. The season had been a dry one and water was scarce in the vicinity.

We obtained a number of specimens, of several different subspecies, never knowing what the next one would prove to be, and later found that Little had been equally successful on the brushy hillside where he had been working, which was along the road leading to the springs. A large number of fox sparrows were moving in the brush there, and many flew across the road. Little's notes relate that "the fox sparrows were very abundant and, as they flew about making a thrush-like noise, or better yet, the junco note, I thought the country must be overrun with thrushes or juncos." None of us had ever before in our lives seen such a number of these birds at any one time.

This movement recalled to my mind a late September day, many years ago, when I was staying with Mr. William Kent, at Kentfield, Marin County, California, when we were deer hunting on a spur of Mt. Tamalpais. At one time during that morning, as I was sitting on a rock overlooking a steep, brushy canyon, I noticed a most curious rustling on all sides below me, which I could not at first account for. After watching for a while, I caught sight of a fox sparrow scratching under a thick bush near by, and it gradually dawned on me that this subdued, but vast—if such an expression be allowed in this case—rustling was being produced by a great number of individuals of this bird group scratching for the seeds among the dead leaves of manzanita and ceanothus bushes. As but few of the birds came to the surface of this sea of

brush it was difficult to see them or to get an idea of what subspecies they belonged to, and, most unfortunately, we had nothing smaller than rifles with which to collect any for identification. This was certainly a regular "wave" of migration; and in all my years of hunting and collecting at the old Rancho San Geronimo, only about five miles north of this spur of the mountain, with equally brushy areas and at about the same elevation, I had never encountered one like it.

But to return to Castle Springs: About the middle of the morning we had enough specimens to keep us busy for the rest of the day, so we returned to headquarters and went to work saving them, which took us until six o'clock in the evening. About that time a breeze came up and it commenced to cool off quite rapidly. The breeze soon developed into a howling gale and sleep was impossible that night in the tent-house we were occupying.

A dense fog drove in with the gale and by morning everything was dripping, with the prospects anything but alluring for favorable observation. My brother had to return to his own home that day and the outlook for better weather was so poor that I decided to take advantage of his transportation facilities and drop down to Harbin Springs to see what was going on at a lower elevation, where the weather was apt to be more favorable for us. But the next day it commenced to rain and the bushes were too wet to work in. As soon as the weather permitted, we resumed our observation of fox sparrows in the surrounding brush, which was fairly well adapted to their needs. It seemed as if the rain should have made ideal scratching ground for these birds but, while we found a few there, they were not numerous, and even these became scarcer as the days went by. Soon they became so scarce that we concluded the "run" must be over and that it would not pay us to remain longer.

Of the different individuals taken were many that were very difficult to place satisfactorily. At Glenbrook, September 23 and 24, the Yolla Bolly Fox Sparrow was the most numerous, comprising 60 per cent of the number secured, but at Castle Hot Springs, of those taken during the migratory wave of September 26, 1919, the percentage of this subspecies was 30. This sparrow was usually easily recognized, even in the brush, where not too dark to see it well, as its grayish back and light colored breast were quite conspicuous among the more reddish or brownish races. Evidently this race begins to forsake its breeding ground long before harsh weather conditions compel it to do so, as the comparatively low elevations at which it breeds in California—5000 to 6000 feet—are not particularly cold nor subject to severe snow storms as early in the fall as the date at which we found it common.

The greater number of the *Unalaschcensis* group, that is of the darker, more reddish, and more slender-billed races, which we secured are referable to the forms Valdez, Yakutat and Sooty Fox Sparrows (*Passerella iliaca sinuosa*, *annectens* and *fuliginosa*, respectively), with a good deal of intergradation between, and the first two predominating in numbers; yet there were a good many individuals that we could not place. There were also one or two other races represented by a stray bird here and there.

In order to ascertain if the wave of migration was an annual occurrence I went again to Castle Hot Springs in 1920, taking with me Mr. Chase Littlejohn as assistant. So as to be on the ground in plenty of time to observe the migration, should it occur, September 19 was the date selected for the com-

mencement of our vigil, as being a week earlier than the date of the big wave of 1919.

That morning found us in readiness for any sized wave that might come along, but none came that day nor for a good many days thereafter. We found a few fox sparrows scattered through the brush, and tried by various means to watch them, as well as to secure specimens for identification, finally coming to the conclusion that the best method was to camp down near some of the far from numerous water holes and wait to see what might come to drink. We cleared the trash from under the thick brush so that we could see a few yards around about and kept still for hours at a time.

Of those which we saw under these conditions, some certainly came there to bathe and drink, but a good many appeared only to be passing along, often chirping the characteristic fox sparrow note, so much like a similar note of the juncos. Evidently the Yolla Bolly Fox Sparrow, which was almost the only form we saw for the first few days of our stay, was dropping down, just as at Glenbrook, from its comparatively near breeding grounds which extend from Mt. Sanhedrin, Snow Mountain, etc., up into the Yolla Bolly and Trinity ranges. Probably the birds we first saw were from Sanhedrin and the adjacent mountains not much over 60 miles away, while the later ones came from the more northerly ranges.

The only way to find out what subspecies were passing thorough was to secure some specimens each day. Some days we would obtain only one or two apiece, while on others we would do a little better, but toward the end of the month there was a very decided increase in the numbers noted although nothing that could be described as a "wave" had materialized. It appeared as if the migration this year was just a sort of drifting process and it did not seem worth while for both of us to stay to watch this, so I decided to return to San Francisco, but to leave Littlejohn for a few days longer just in case something might happen. We had been breakfasting on cold bread and milk at daylight so as to reach the observation grounds as soon as it was light enough to see clearly. On the morning of September 30 I was all packed up to leave and was breakfasting at the civilized time of 7:30 when Littlejohn, who had gone out at our usual early hour, came in breathless to say that when he reached the grounds "the hillsides were alive with fox sparrows".

According to his description they were coming in bunches from the north, numbers settling in the brush or along the road for a few moments to scratch, while others appeared and passed beyond, the different bunches thus constantly overlapping as so often do blackbirds when feeding in flocks, those in the rear continually rising and flying ahead of the advance guard.

Hurrying back in all haste to my quarters, unpacking and getting the necessary paraphernalia together, I made the best speed of which I was capable up the grade to the spot, but arrived just in time to be too late. Not a sparrow was in sight. The rest of the morning was passed in the hope of a second wave appearing but nothing of the kind happened. We secured a few scattering specimens, but that was all.

Still in the hope of a repetition of the occurrence we remained here until October 5, and I was partially rewarded by the advent of at least a small wave which, insignificant as it was in size, gave me an opportunity to see what the actions of the individuals composing it were like.

This migratory wavelet was noted on the morning of October 4, just before sunrise. As I reached the extremity of the brush-land where, around a sharp spur, the woods commenced again on the north side, I ran into this small band of new arrivals, perhaps a dozen or so. As expressed in my notes taken at the time these birds "came out of the brush like flying fish out of a wave" and dove in again a little farther on, but whether they came up out of the woods on the north, or had flown clear across the deep canyon over the tops of the trees from Mt. Cobb, I had no way of judging as I was a few seconds too late to see just in what manner they had landed on this spur. After a while we went down to the places which we had cleared around the water holes and soon noted birds that appeared to be new arrivals, as they were very thirsty.

It would seem from these observations that the fox sparrows travel extensively in the night and early morning. The wave of 1919 was much larger than anything we saw in 1920, and the birds seen in that case had evidently camped down for the day, the intense heat of which induced them to seek water, thus creating the activity which we observed.

As before remarked, almost all the birds first taken at Castle Hot Springs were the Yolla Bolly Fox Sparrow; but by September 28 the ratio commenced to change and toward the last of our stay the proportion was very small, the average being about 38 per cent for the whole period of observation.

Of the other subspecies taken, practically all belonged to the Unalascensis group, but they seemed to run rather darker than those of the previous year. Many of these I have placed with the Yakutat and Sooty forms (*P. i. annectens* and *fuliginosa*); but few, however, are typical, and there are many individuals which neither Mr. H. S. Swarth—who is our best authority on fox sparrows today—nor I can satisfactorily place, this being true of many of those taken in the fall of 1919 as well.

These undetermined individuals appear to belong somewhere between the Valdez and Sooty Fox Sparrows as before remarked, although none approached the more reddish race, *townsendi*; but as a whole they are so nearly homogeneous that it seems as if there might be some locality to the north of us, unexplored as far as fox sparrows are concerned, which may prove to be the breeding ground of a more or less distinct race, and from which these at present undetermined birds come. Meanwhile these particular specimens lie in our cases with the label marked "subsp.?" There is a good deal yet to be learned about our speckle-breasted friends, the fox sparrows.

*San Francisco, September 8, 1921.*